rejection failed to demonstrate that Solomon discloses the *identical* invention as arranged in the claim.[2]

The Claimed Subject Matter

As demonstrated in further detail below, the rejection under §102 is legally improper because the applied reference fails to disclose or suggest the claimed features of independent claims 1, 12, 34, 45 and 48, namely that: (1) each of the network nodes generate their ***own respective decisions*** (as in claims 1, 12, and 34) or ***movement directives from optimization of routing metrics*** (as in claims 45 and 48); (2) the network nodes generate their decisions (or optimizations) ***autonomously of each other***; or (3) the network node ***synchronizes*** its world objects (or detected attribute information) with the ***other network nodes***, enabling the respective decisions by the network node to be ***coordinated*** with the other network nodes.

(1) Each Node Generates Its Own Decision (Optimization of Routing Metrics)

Independent claims 1, 12, and 34 each specify that each of the network nodes generate their ***own respective decisions***. In particular, independent claims 1, 12 and 34 each specify that the world object database within the network node includes smart world objects configured for ***generating decisions*** based on an evaluation of selected world objects, at least one of the decisions causing generation of a directive for optimization of the network nodes relative to the other network nodes. Independent claims of 45 and 48 each specify the network node generating a ***movement directive*** based on the network node ***executing an optimization of routing metrics*** according to a prescribed routing protocol, the movement directive causing the mobility platform in the network node to implement the optimization by implementing a physical change for the network node; hence, the execution of the optimization of routing metrics by the network node results in the network node generating the movement directive.

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[2] See MPEP 2131. "The identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). "Anticipation requires the presence in a single prior art reference disclosure of each and every element of the claimed invention, arranged as in the claim." *Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick Co.*, 221 USPQ 481, 485 (Fed. Cir. 1984). Hence, it is not sufficient that a single prior art reference discloses each element that is claimed, but the reference also must disclose that the elements are arranged as in the claims under review. *In re Bond*, 15 USPQ2d 1566, 1567 (Fed. Cir. 1990) (citing *Lindemann Maschinenfabrik GmbH*).

As illustrated in Figure 2 and described at page 8, lines 21-28, the routing resources 20 are configured for execution of the routing protocol for the mobile node 12, including generating movement directives. The routing resources 20 include executable resources and protocols 30, illustrated in Figure 8, configured for deciding and implementing decisions and directives (see, e.g., page 17, lines 19-20). As illustrated for example in Figure 9 and at page 13, lines 4-6, page 15, lines 8-13, pages 16, lines 17-24, page 18, lines 9-18, and page 19, lines 4-17, the decisions can be executed by a "brain" object 112 that considers advice elements (e.g., A1, A2, and A3) generated by reaction objects 114. The brain object 112 forms a decision by adding a new force vector (Fv) to a smart world object 110, enabling a directive to be generated based on the force vector.

Further, the specification distinguishes between "decisions" and "reactions": a reaction by a "reaction object" 114 reacts to a stimulus by suggesting a change in the form of an advice element (e.g., A1 of Fig. 9); in contrast, a decision by the brain object 112 considers the various elements of all its reactions based on applying different weighting factors according to respective influence factors, in order to form the decision (see, e.g., page 13, lines 4-12; page 18, line 9 to page 19, line 17).

(2) The Network Nodes Execute Their Decisions/Optimizations Autonomously of Each Other

Each of the independent claims also specify that the network node and the other network nodes generate their respective decisions (or execute their respective optimizations of routing metrics) ***autonomously*** of each other (see, e.g., page 4, lines 3-9 and 20-28; page 6, line 16-20; page 8, lines 1-14; page 15, lines 3-13; page 16, lines 17-24; page 18, lines 9-18; page 22, lines

11-18). As such, the claimed network node is illustrated in the specification as a "wireless and ***autonomous*** robotic mobile access point" (e.g., page 6, lines 19-20; page 16, lines 28-29), such that the network node can execute its own decisions without the necessity of receiving directives or commands from another network node, *i.e.*, each network node is configured for executing decisions independent of any external control from another network node.[3]

Hence, the claimed network node, generates its own decision ***autonomously*** of any of the other network nodes, i.e., without control by any of the other nodes.

(3) The Network Nodes Synchronize Their World Objects/Detected Attributes

Each of the independent claims also specify that the claimed network node ***synchronizes*** detected attribute information (or its world objects) with other network nodes, enabling the decisions by the network node to be ***coordinated*** with the other network nodes. As described in the specification, the synchronization of the respective databases (page 4, line 23) provides "a level of understanding between all the mobile nodes 12 as to the state of the network 10 from the perspective of each of the individual nodes 12" (page 8, lines 5-6), enabling the inheritance of objects from other mobile nodes by the world object database 100 to represent a model of the entire mobile network (page 9, lines 8-12).

As described for example at page 8, lines 1-14, the autonomous and *coordinated* decisions by the mobile nodes enables the mobile network to become a dynamic entity, without actually programming the mobile nodes.

Claims 1, 12, and 34 further specify that the world objects stored in the network node include: (i) smart world objects that generate the decisions; (ii) sensor objects from sensor data; (iii) second network node objects representing attributes of the other network nodes; and (iv) a world object specifying a directive generated based on at least one of the decisions for optimization of the network node. Hence, the claimed synchronizing of the world objects causes all of these four types of world objects to be synchronized with the other network nodes, enabling autonomous and coordinated decisions between the network nodes based on each network node having a complete understanding of the state of the network and the other network nodes in the network.

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[3] See Attached Exhibit A (page 93 of Webster's New World Dictionary, 3d. College Ed.), defining "autonomous" as "functioning independently without control by others."

These and other claimed features are neither disclosed nor suggested in the applied prior art.

Solomon

(1) No Disclosure that The Network Nodes Generate their Respective Decisions

Solomon fails to disclose or suggest that the claimed network node and the other network nodes ***generate their respective decisions*** (or execute their respective optimizations of routing metrics), as claimed. To the contrary, Solomon consistently describes a hierarchical system that relies on a lead MRV controlling subordinate MRVs, or "drone MRVs" (illustrated in Fig. 9 at 0940 as slaves), where "both the swarm level and the squad level involve hierarchical control in which **a centralized leader controls the drone followers**" (para. 2, lines 1-3).

Solomon consistently describes that the drone MRVs (i.e., the "slaves") send their sensor data only to a lead MRV (see, e.g., step 1615 of Fig. 16 and para. 176).[4] The drone MRVs do not send their sensor data to other drone MRVs, but only to the lead MRV.

Solomon consistently describes that the lead MRV executes a decision on behalf of the drone MRVs, generates instructions for implementation of the decision, and transmits the instructions to the drone MRVs. Hence, "[t]he sensor data is supplied to the squad or swarm **lead MRVs** (or retransmitted to external computation resources) in order to be analyzed in real time" (para. 24, lines 1-4). In other words, "[t]he squad leader has mission program parameters that specify particular goals and rules," (para. 25, lines 1-2), and "the lead MRV is the dominant player for decision-making. Group 'decisions' are limited to the sensor data supplied by various

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[4] See also para. 24, 30-31, 151, 165, 173, 175, 176, 181, 194, 198, 200, 201, 202, 210, 216, 220, 230, 233, 240, 281-85, 287, 289, 291, and 292.

MRVs" (para. 30, lines 8-10). Consequently, "[t]he geometric configuration and reconfiguration of groups of MRVs are determined by **lead MRVs** by comparing the sensor data with mission program parameters. The leader must calculate the most efficient way to organize the group for an effective mission."

Hence, Solomon describes that all decisions are executed by the **lead MRV** (e.g., an AWACS aircraft, see para. 204) having moral responsibility (see, e.g., para. 10, 22, 169), based on sensor data received by the lead MRV from the drone MRVs (see, e.g., Fig. 16 at 1615 through 1660; Fig. 29 at 2950, Fig. 37 at 3730-3775, Fig. 70 at 7040 and 7045, Fig. 73 at 7360, para. 30, 151, 165, 170-173, 176, 189, 202, 203, 280, 283). Solomon also describes that the lead MRV is configured for resolving conflicts (para. 292).

The decisions executed by the lead MRV are implemented by the lead MRV transmitting "simple rules" to the drone MRVs (see, e.g., Fig. 16 at 1660, Fig. 18 at 1820 and 1830, Fig. 37 at 3780, Fig. 73 at 7370, and para. 165, 173, 176, 181, 283).

The drone MRVs use the local rules to implement "pure behavior-based methods" (Fig. 17, para. 179, esp. lines 2-4) limited to reacting to sensor data (environmental stimuli) according to the "simple rules" (see, e.g., Figs. 17 at 1740-1750 and Fig. 18 at 1840-1850, Fig. 30 at 3050, and para. 149, 152, 165, 179, 181, 207). Solomon also specifies that the "simple rules" executed by the drone MRVs are limited to reactions such as "move towards the center of the pack", "avoid collisions with neighbors" and "follow the leader", which are basic "flocking" principles the combination of which exhibit flocking behaviors (see Fig. 18 at 1830, 1850, Fig. 30 at 3050, para. 181, 207, 217).

Hence, Solomon consistently discloses that the **lead MRV** executes decisions and transmits "rules" to the drone MRVs, and the drone MRVs implement "behaviors" by performing "actions" and "reactions" in response to environmental stimuli (based on sensor data) in accordance with the "rules" from the lead MRV.

Hence, Solomon fails to disclose or suggest that the drone MRVs execute their own decisions (or optimization of routing metrics according to a prescribed routing protocol), as claimed.

The Examiner indicated during the February 25, 2009 personal interview that the "responses" by the drone MRVs could be considered "decisions". This argument, however, is a gross mischaracterization of Solomon, which explicitly distinguishes between decisions that are generated in the lead MRV, and reactions that are implemented in the drone MRVs in response to the rules from the lead MRV.[5]

Further, the rejection asserts the legally improper argument on page 3 of the Final Action that certain cited portions of Solomon "**suggests** each 'network node' is *capable* of making independent decisions." This statement is ***per se*** **improper** because it conflicts with the explicit requirements of an anticipation rejection that the reference must *explicitly* describe the *identical* subject matter as arranged in the claim.[6]

Further, Solomon provides no reference whatsoever the claimed term "routing", and therefore cannot disclose the claimed optimization of ***routing metrics*** according to a ***prescribed routing protocol***. As described in the specification, execution of a routing protocol requires a decision of how to route data packets in a network:

> As described above, the ***routing protocol*** of the disclosed embodiment considers movement of its physical platform as an option to optimize routing metrics. Hence, the routing resources of each mobile node include movement of its physical platform, and all factors and consequences associated with executing decisions related to movement, as part of the decision-making process to determine how to respond to inputs, ***including how to route data packets....***
>
> Hence, each of the mobile nodes 12 decide ***how*** to ***route packets***, and move their respective mobility platforms, based on the available information from local sensors and information shared between the other mobile nodes.

(Page 7, line 30 to page 8, line 4 and page 8, lines 7-9).

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[5] "A prior art patent is a reference only for that which it teaches." *Corning Glass v. Sumitomo Electric*, 9 USPQ2d 1962, 1970 (Fed. Cir. 1989).

[6] "Anticipation cannot be predicated on teachings in the reference which are vague or based on conjecture." *Studiengesellschaft Kohle mbH v. Dart Industries, Inc.*, 549 F. Supp. 716, 216 USPQ 381 (D. Del. 1982), *aff'd.*, 726 F.2d 724, 220 USPQ 841 (Fed. Cir. 1984).

Solomon provides no reference to the claimed "routing", and fails to disclose any alternative as to how packets should be routed; Solomon assumes a strict hierarchy, where all drone MRVs supply their sensor data to the lead MRV, and the lead MRV supplies its instructions to its drone MRVs.

For these reasons alone the §102 rejection must be withdrawn.

(2) No Disclosure that The Network Nodes Generate their Respective Decisions Autonomously of Each Other

The Examiner's argument that the local reaction by a drone MRV could be considered a "local decision" also fails to address the claimed feature that the network node ***and the other network nodes*** execute their respective decisions (or optimizations) ***autonomously of each other***, i.e., independently without control by others. As described previously, Solomon describes that the drone MRVs are controlled by the lead MRV.

The reference to step 2310 of Fig. 23 on page 3 of the Final Rejection is misplaced and on its face legally improper, because the rejection argues that "each MRV tracks all other MRVs in swarm in real time -> *suggests* each 'network node' is *capable* of making independent decisions." This argument is legally improper in an anticipation rejection: the reference must ***clearly*** and ***unequivocally*** disclose the claimed subject matter in an anticipation rejection.[7]

Further, the reliance to step 2310 of Fig. 23 is unfounded and demonstrates a tortured interpretation of the reference: step 2310 of Fig. 23 is described at paragraph 194 of Solomon, which states in its entirety:

> [0194] FIG. 23 illustrates the process of MRV intercommunication. Every MRV tracks the location and movements of all other MRVs in the swarm in real time (2310) **by using a coded multichannel wireless communication model**. The lead MRV communicates with other MRVs by sending signals specifically coded to each MRV (2320). **When MRVs encounter objects in their environment, they send sensor data to the lead MRV (2330)**. Since MRVs are added and removed from the swarm, reinforcement MRV codes are transmitted to the lead MRV so that the new MRVs can be added to the system

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[7] See footnotes 2, 5 and 6 *supra*.

> (2340). As the squads are created from the main swarm, select intrasquad communications are sent to other squad members via the lead MRV by using specific codes to contact the MRVs directly (2350). One of the main methods of communicating between MRVs is the use of mobile software agent computer program code (2360). By using mobile software agents, the MRV initial program parameters are continually supplemented. By implementing the use of mobile software agents that travel wirelessly between MRVs, the swarm system can use not only communications devices in a distributed network but also sophisticated computer resources. The reprogrammability capability of using mobile software agents also allows the system to reconfigure itself automatically using the communication system.

Solomon simply says that each MRV tracks all other MRVs in swarm in real time, with no description as to how or why each MRV tracks all the other MRVs. In fact, step 2330 describes the MRVs sending sensor data to the lead MRV for "objects" encountered in their environment, hence the location and trajectory data detected by a drone MRV would be sent to the lead MRV for review and analysis. The assertion that step 2310 "suggests" each network node is "capable" of making independent decisions is speculative, without foundation, and improper under §102.

As demonstrated *supra*, Solomon consistently describes that each drone MRV must receive its "simple rules" from the lead MRV in order for the drone MRV to be able to execute its "pure behavior-based methods", namely reacting to a stimulus in response to locally-generated sensor data. Hence, the reaction by a drone MRV cannot be considered "autonomous" because by definition (see Exhibit A) the "autonomous" excludes the external control imposed by the lead MRV's instructions to the drone MRV.

For this reason alone the §102 rejection must be withdrawn.

(3) No Disclosure that the Network Node Synchronizes with the (Plural) Other Network Nodes

Solomon neither discloses nor suggests the claimed feature of the network node ***synchronizing*** its world objects (detected attribute information) enabling the ***autonomous decisions*** (movement directive) by the network node to be ***coordinated*** with the other network nodes. Solomon describes no more than the behaviors of multiple drone MRVs to "appear" coordinated[8] due to being supplied the same rules from the lead MRV. In contrast, the claims specify that the ***autonomous decisions*** are ***coordinated*** among the network nodes based on the ***synchronizing*** by the network node with the other network nodes.

The drone MRVs in Solomon do not send their sensor data to other drone MRVs, but only to the lead MRV. For this reason alone the rejection must be withdrawn because there is no disclosure of the claimed synchronizing with ***the other nodes***: the drone MRVs send their sensor data only to the lead MRV.

There is no disclosure or suggestion in Solomon that the lead MRV transmits to any of the drone MRVs any of the sensor data received by the lead MRV: if a drone MRV (A) transmits its sensor data (sensor_data_A) to the lead MRV and a drone MRV(B) transmits its sensor data (sensor_data_B) to the lead MRV, there is no disclosure or suggestion in Solomon that the drone MRV(A) receives the sensor data (sensor_data_B) or that the drone MRV(B) receives the sensor data (sensor_data_A), because the sensor data is used only by the lead MRV.

For this reason alone the rejection must be withdrawn because Solomon fails to disclose the lead MRV ***synchronizing*** the world objects (or the detected attribute information) with ***the other network nodes***, as claimed. To the contrary, the drone MRVs transmit only sensor data to their lead MRV, and the lead MRV transmits only instructions to the drone MRVs.

The reliance on Figure 2 in the Final Action as a disclosure of "synchronizing its world objects" is per se unreasonable, especially because Solomon describes in paragraph 160 that the "distributed" processing and the sharing of "computer resources" in steps 0220 and 0230 is in the context of a hierarchical organization in a heterogeneous system. In fact, Solomon states that "[t]he sharing of computer resources [is] **in order to share sensor data** (0220)", demonstrated throughout Solomon as referring to transferring sensor data from the drone MRV to the lead MRV in order to enable the lead MRVs (squad leaders) to execute decisions *on behalf of* the drone MRVs.

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[8] "By using various rules of behavior, MRVs react to an environmental stimulus (1750) and behave in a specific way that, when combined with other MRV similar behaviors, **appears** coordinated." (Para. 179, lines 12-15).

Further, the specification of Solomon provides no reference or description of any "parallel processing" capabilities. In fact, the attached Exhibit B[9] demonstrates that the most likely parallel processing technology (massively parallel processor systems) would not synchronize because "**nothing is shared among the nodes**" (SMP requires a shared bus that is not feasible for wireless networks). Further, Solomon consistently describes the distributed network processing model within the context of a hierarchical model, where "the system is organized for central control between a leader and a number of followers" (para. 160, lines 2-4).

The sharing of database memory in step 240 is described in further detail in Figure 16, where database inter-relations are illustrated by the drone MRVs sending their sensor data ***to the lead MRV***, and the lead MRV sending its instructions ***to the drones***.

Consequently, the "sharing" of information is not a disclosure of ***synchronizing***, as claimed, especially because the "sharing" in Solomon is a "one-way" sharing of sensor data from the drone MRVs ***to*** the lead MRV, and instructions from the lead MRV ***to*** the drones. Sharing is not a disclosure of synchronizing.

Finally, neither step 0310 in Fig. 3 nor step 2310 of Fig. 23 disclose or suggest the claimed synchronization: paragraph 161, lines 1-3 describes step 0310 as a trivial hardware step of "checking" hardware operation. Paragraph 194 describes that "[e]very MRV tracks the location and movements of all other MRVs in the swarm in real time (2310) by using a coded multichannel wireless communication model." This statement is vague because it could simply mean that MRVs can track each other based on the corresponding detected signal strength. Regardless, Solomon does not disclose or suggest that the sensor data is exchanged between MRVs, or that the reactions by MRVs are shared with other MRVs. Hence, Fig. 23 is insufficient to establish the claimed ***synchronizing*** of ***the world objects*** (or the detected attribute information) enabling the ***decisions*** (or the movement directive) by the network node to be ***coordinated with the other network nodes***, as claimed.[10]

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[9] Encyclopedia of Networking, Electronic Edition (1998), "Parallel Processing" (4 pages)

[10] See footnote 2, 5, and 6 *supra*.

For these and other reasons, the §102 rejection must be withdrawn.

It is believed the dependent claims are allowable in view of the foregoing.

In view of the above, it is believed this application is in condition for allowance, and such a Notice is respectfully solicited.

To the extent necessary, Applicant petitions for an extension of time under 37 C.F.R. 1.136. Please charge any shortage in fees due in connection with the filing of this paper, including any missing or insufficient fees under 37 C.F.R. 1.17(a), to Deposit Account No. 50-1130, under Order No. 10-004, and please credit any excess fees to such deposit account.

Respectfully submitted,

Leon R. Turkevich
Registration No. 34,035

Customer No. 23164
Date: February 27, 2009

Attached: **Exhibit A (1 page)**
Exhibit B (4 pages)

or tissue transplant Also **au′to·gen′ic** (ôt′ə jen′ik) —**au·tog′e·nous′ly** *adv.*

au′to·gi′ro or **au′to·gy′ro** (ôt′ə jī′rō) ***n.**, pl.* **-ros** ⟦Sp, orig. a trademark, *Autogiro* < *auto-*, AUTO- + Gr *gyros*, a circle: see GYRATE⟧ an aircraft that moves forward by means of a propeller and is supported in the air mainly by means of a large rotor mounted horizontally above the fuselage and turned by air pressure rather than motor power: largely superseded by the HELICOPTER

au′to·graft (ôt′ō graft′) ***n.*** any tissue grafted from one location to another on the same individual: see ALLOGRAFT, XENOGRAFT

au′to·graph (ôt′ə graf′) ***n.*** ⟦L *autographum*, neut. of *autographus* < Gr *autographos*, written with one's own hand < *autos*, self + *graphein*: see GRAPHIC⟧ **1** a signature, handwritten inscription, etc., esp. that of a famous person which is valued as a memento **2** a thing written in one's own handwriting; original manuscript; holograph —***vt.*** **1** to write (something) with one's own hand **2** to write one's signature on or in

au′to·graph′ic (ôt′ə graf′ik) ***adj.*** **1** of, for, or like an autograph or autographs **2** written in one's own handwriting —**au′to·graph′i·cal′ly** *adv.*

au·tog′ra·phy (ô täg′rə fē) ***n.*** ⟦< AUTOGRAPH⟧ **1** the writing of something with one's own hand **2** a person's own handwriting **3** autographs in general

☆**Au′to·harp** (ôt′ō härp′) ⟦AUTO- + HARP⟧ *trademark for* a type of zither for playing chordal accompaniments by means of a series of dampers worked by keys —***n.*** [**a-**] such a zither

au′to·hyp·no·sis (ôt′ō hip nō′sis) ***n.*** the act of hypnotizing oneself or the state of being so hypnotized —**au′to·hyp·not′ic** (-nät′ik) ***adj.***

au′to·im·mune (-i myo͞on′) ***adj.*** initiating or resulting from the production of autoantibodies, sometimes with damage to normal components of the body —**au′to·im·mu′ni·ty** ***n.***

au′to·in·fec·tion (-in fek′shən) ***n.*** infection from a source within the organism itself, as from harmful bacteria previously present but not in contact with vulnerable areas

au′to·in·oc′u·la·tion (-in äk′yo͞o lā′shən) ***n.*** **1** inoculation of a patient with a vaccine prepared from microorganisms from the patient's own body **2** a spreading of infection from one part to other parts in the body

au′to·in·tox′i·ca·tion (-in täks′i kā′shən) ***n.*** poisoning by toxic substances generated within the body

☆**au′to·load·ing** (ôt′ō lōd′iŋ) ***adj.*** SEMIAUTOMATIC (sense 2)

au·tol′o·gous (ô täl′ə gəs) ***adj.*** ⟦AUTO- + (HOMO)LOGOUS⟧ derived from the same organism or from one of its parts *[an autologous graft]*: see HOMOLOGOUS (sense 5)

au·tol′y·sate (ô täl′ə sāt′, ôt′ə lī′sāt) ***n.*** ⟦AUTOLYS(IS) + -ATE²⟧ a product of autolysis

au′to·ly·sin (ôt′ə lī′sin, ô täl′ə sin) ***n.*** ⟦< fol. + -IN¹⟧ a substance that produces autolysis

au·tol′y·sis (ô täl′ə sis) ***n.*** ⟦AUTO- + -LYSIS⟧ the destruction of cells or tissues by their own enzymes, as after death or in some diseases —**au′to·lyt′ic** (ôt′ə lit′ik) ***adj.***

au′to·lyze (ôt′ə līz′) ***vt.**, **vi.*** **-lyzed′**, **-lyz′ing** to affect with or undergo autolysis

au′to·mat (ôt′ə mat′) ***n.*** ⟦Ger < Gr *automatos*: see AUTOMATIC⟧ a restaurant in which patrons get food from small compartments with doors that open when coins are put into slots

au·tom′a·ta (ô täm′ə tə) ***n.*** *alt. pl. of* AUTOMATON

☆**au′to·mate** (ôt′ə māt′) ***vt.*** **-mat′ed**, **-mat′ing** ⟦back-form. < AUTOMATION⟧ **1** to convert (a factory, process, etc.) to automation **2** to use techniques of automation in *[teaching is being automated]*

au′to·mat′ic (ôt′ə mat′ik) ***adj.*** ⟦< Gr *automatos*, self-moving, self-thinking (< *autos*, self + component < IE **mntos*, thinking < base **men-*, to think > MIND, MEMORY) + -IC⟧ **1** done without conscious thought or volition, as if mechanically **2** involuntary or reflex, as some muscle or gland action **3** *a)* moving, operating, etc. by itself; regulating itself *[automatic machinery]* *b)* done with automatic equipment *[an automatic landing]* **4** *Firearms a)* using the force of the explosion of a shell to eject the empty cartridge case, place the next cartridge into the breech, and fire it, so that shots continue in rapid succession until the trigger is released *b) nontechnical name for* SEMIAUTOMATIC (sense 2) —***n.*** **1** an automatic (or, popularly, semiautomatic) firearm **2** any automatic machine **3** an automotive vehicle having a transmission that changes gears automatically —***SYN.*** SPONTANEOUS —**au′to·mat′i·cal′ly** *adv.*

automatic direction finder a type of radio compass that indicates automatically the direction of the station to which it is tuned, used esp. on aircraft

au′to·ma·tic·i′ty (ôt′ə mə tis′ə tē, ô täm′ə-) ***n.*** the condition of being automatic, or the degree of this

automatic pilot a gyroscopic instrument that automatically keeps an aircraft, missile, etc. to a predetermined course and attitude

☆**au′to·ma·tion** (ôt′ə mā′shən) ***n.*** ⟦AUTOMA(TIC) + -TION⟧ **1** in manufacturing, a system or method in which many or all of the processes of production, movement, and inspection of parts and materials are automatically performed or controlled by self-operating machinery, electronic devices, etc. **2** any system or method resembling this in using self-operating equipment, electronic devices, etc. to replace human beings in doing routine or repetitive work *[automation in teaching]* **3** the condition of being automated

au·tom′a·tism (ô täm′ə tiz′əm) ***n.*** ⟦AUTOMAT(IC) + -ISM⟧ **1** the quality or condition of being automatic **2** automatic action **3** *Philos.* the theory that the human or animal body is a machine governed by physical laws and that consciousness does not control but only accompanies its actions **4** *Physiol. a)* action independent of outside stimulus, as sleepwalking *b)* action not controlled by the will, as the heartbeat *c)* the power of such action **5** *Psychol.* an automatic or unconscious action, as a tic **6** free expression of the unconscious mind by releasing it from the control of the conscious: a surrealist concept —**au·tom′a·tist** ***n.***

au·tom′a·tize (-tīz′) ***vt.*** **-tized′**, **-tiz′ing** **1** to make automatic **2** AUTOMATE —**au·tom′a·ti·za′tion** ***n.***

au·tom′a·ton (ô täm′ə tän′, -tən) ***n.**, pl.* **-tons′** or **-ta** (-tə) ⟦L < Gr, neut. of *automatos*: see AUTOMATIC⟧ **1** anything that can move or act of itself **2** an apparatus that automatically performs certain actions by responding to preset controls or encoded instructions **3** an electronic machine, control device, etc. equipped with a computer and designed to operate automatically in response to instructions previously fed into the computer **4** a person or animal acting in an automatic or mechanical way

☆**au′to·mo·bile** (ôt′ə mə bēl′, -mō-; ät′-; ôt′ə mə bēl′; ôt′ə mō′bēl) ***n.*** ⟦Fr: see AUTO- & MOBILE⟧ a passenger vehicle, usually four-wheeled, propelled by an engine or motor that is part of it, esp. an internal-combustion engine, and meant for traveling on streets or roads; motorcar

au′to·mo·tive (ôt′ə mōt′iv) ***adj.*** ⟦AUTO- + -MOTIVE⟧ **1** moving by means of its own power; self-moving **2** of or having to do with automobiles or other motor vehicles

au′to·nom′ic (-näm′ik) ***adj.*** **1** occurring involuntarily; automatic **2** of or controlled by the autonomic nervous system **3** *Biol.* resulting from internal causes, as through a mutation —**au′to·nom′i·cal′ly** *adv.*

autonomic nervous system the part of the nervous system that is responsible for control and regulation of the involuntary bodily functions, including those of the heart, blood vessels, visceral smooth muscles, and glands: it consists of the sympathetic system which, in general, stimulates the body to prepare for physical action or emergency, and the parasympathetic system which, in general, stimulates the opposite responses

au·ton′o·mist (ô tän′ə mist) ***n.*** a person desiring or advocating autonomy

au·ton′o·mous (-məs) ***adj.*** ⟦Gr *autonomos*, independent < *autos*, self + *nomos*, law: see -NOMY⟧ **1** of or having to do with an autonomy **2** *a)* having self-government *b)* functioning independently without control by others **3** *Biol. a)* existing, functioning, or developing independently of other parts or forms *b)* autotrophic *c)* resulting from internal causes; autonomic

au·ton′o·my (-mē) ***n.*** ⟦Gr *autonomia*⟧ **1** the fact or condition of being autonomous; self-government; independence **2** *pl.* **-mies** any state that governs itself

au′to·phyte (ôt′ə fīt′) ***n.*** ⟦AUTO- + -PHYTE⟧ any plant that makes its own food from inorganic matter —**au′to·phyt′ic** (-fit′ik) ***adj.*** —**au′to·phyt′i·cal′ly** *adv.*

au′to·pi′lot (-pī′lət) ***n.*** AUTOMATIC PILOT

au′to·plas′ty (-plas′tē) ***n.*** ⟦AUTO- + -PLASTY⟧ the repairing of injuries by grafting in tissue from another part of the patient's body: see HOMOPLASTIC (sense 2), HETEROPLASTY —**au′to·plas′tic** ***adj.***

au′top·sy (ô′täp′sē, ôt′əp sē) ***n.**, pl.* **-sies** ⟦ML & Gr *autopsia*, a seeing with one's own eyes < Gr *autos*, self + *opsis*, a sight < *ōps*, EYE⟧ **1** an examination and dissection of a dead body to discover the cause of death, damage done by disease, etc.; post-mortem **2** a detailed critical analysis of a book, play, etc., or of some event —***vt.*** **-sied**, **-sy·ing** to examine (a body) in this manner

au′to·ra′di·o·graph (ôt′ō rā′dē ə graf′) ***n.*** ⟦AUTO- + RADIOGRAPH⟧ an X-ray photograph made by bringing an object containing radioactive material into close contact with the emulsion on a film or plate: it shows the pattern of radioactivity in the object Also **au′to·ra′di·o·gram** —**au′to·ra′di·o·graph′ic** ***adj.*** —**au′to·ra′di·og′ra·phy** (-ä′grə fē) ***n.***

au′to·some (ôt′ə sōm′) ***n.*** ⟦AUTO- + (CHROMO)SOME⟧ any chromosome that is not a sex chromosome; specif., either of a pair of like chromosomes in a diploid cell —**au′to·so′mal** (-sō′məl) ***adj.***

au′to·stra′da (ôt′ō strä′də; *It* ou′tô strä′dä) ***n.**, pl.* **-das** or **-de** (-de) ⟦It < *auto*, contr. < *automobile* (< Fr: see AUTOMOBILE) + *strada*, road < LL *strata*: see STREET⟧ in Italy, an expressway

au′to·sug·ges·tion (ôt′ō səg jes′chən) ***n.*** suggestion to oneself arising within one's own mind and having effects on one's thinking and bodily functions

au′to·tel′ic (-tel′ik) ***adj.*** ⟦< Gr *autotelēs*, complete in itself (see AUTO- & TELEOLOGY) + -IC⟧ having an end in itself; engaged in for its own sake, as some creative art —**au′to·tel′ism′** ***n.***

au·tot′o·mize (ô tät′ə mīz′) ***vi.**, **vt.*** **-mized′**, **-miz′ing** to undergo or cause to undergo autotomy

au·tot′o·my (-mē) ***n.*** ⟦AUTO- + -TOMY⟧ the reflex action by which a leg, claw, tail, etc., as of a lobster, starfish, or lizard, is broken off at a special joint when the part is damaged, seized, etc.: the missing part then regenerates —**au′to·tom′ic** (ôt′ə täm′ik) ***adj.***

au′to·tox·e′mi·a or **au′to·tox·ae′mi·a** (ôt′ō täks ē′mē ə) ***n.*** ⟦AUTO- + TOXEMIA⟧ AUTOINTOXICATION

au′to·tox′in (ôt′ō täk′sin) ***n.*** any toxin or poison produced within the body —**au′to·tox′ic** ***adj.***

au′to·trans·form′er (ôt′ō trans′fôrm′ər) ***n.*** *Elec.* a transformer with at least part of the windings common to both the primary and the secondary circuits

au′to·troph′ic (ôt′ō träf′ik) ***adj.*** ⟦AUTO- + TROPHIC⟧ making its own food by photosynthesis, as a green plant, or by chemosynthesis, as

B
C
D
E

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Tom Sheldon

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Parallel Processing

Parallel processing systems provide a way to expand the processing power of a computer system by adding additional processors. With compatible operating systems and software, processing tasks can be distributed across the processors so that none sit idle. The systems are especially useful for database management systems and data warehousing because they provide a way for a system to handle multiple queries from multiple users and access vast quantities of data while doing so. The systems are also used to process very large and complex tasks such as weather forecasting and simulated nuclear weapons testing. Parallel processing systems can be categorized as follows:

- *SMP (symmetrical multiprocessing) servers* are off-the-shelf servers sold by Dell, Compaq, IBM, and other manufacturers. A typical SMP-capable system contains four or more processors and is pictured on the left in Figure P-2. To applications, all the processors appear as a single processor and all the memory is shared, making it easy for programmers to write software for these systems. However, the systems use a shared bus that can bog down under heavy loads.
- *MPP (massively parallel processor) systems* solve the overloaded bus problem by grouping processors into nodes and interconnecting the nodes with a high-speed switch as pictured on the right in Figure P-2. Each node has its own processors, memory, cache, and interconnecting bus. While MPP systems can be scaled up to hundreds or even thousands of processors, software is difficult to write for the systems because nothing is shared among the nodes. There are multiple memory spaces instead of one contiguous memory space, and programs must be divided into segments that run in each node. In addition, nodes exchange information by sending messages to one another since they can't access a shared memory space.
- A *NUMA (Non-Uniform Memory Access) system* is a multinode system that appears as a single SMP computer to applications by using software and hardware techniques that make the memory in separate nodes appear as a large *virtual* block of memory. Program developers see the system as a single SMP system rather than as a multinode system. Each node stores information in its local cache that has been retrieved from other nodes. When the node needs information from another node, it looks in its local cache and retrieves it from the other node. Sequent's NUMA-Quad systems use this technique. Plug-in nodes (called *Quads* because there are four Intel Pentium Pro

processors per node) can be added to scale the system. An interconnect technology called IQ-Link provides the cache coherency that makes memory appear contiguous to programs.

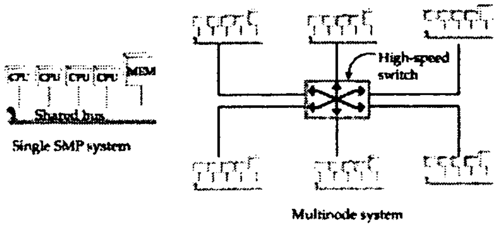

Figure P-2. Symmetrical multiprocessing and multinode parallel computers

Note that clustered systems are similar to MPP and NUMA systems, except that each node is a separate computer system that is interconnected via a high-speed network. To programs, the systems appears as a single virtual parallel computer. See "Clustering" for more details. HPCs (high-performance computers) and supercomputers are discussed under "Supercomputer."

RELATED ENTRIES

Clustering; Distributed Processing; MPP (Massively Parallel Processor) Systems; Supercomputer; *and* Symmetrical Multiprocessing

INFORMATION ON THE INTERNET

Sequent's NUMA papers
http://www.sequent.com/numaq/technology/papers.html

Emergent Corporation's NUMA paper
http://emergent.com/epress/earticle/numa.html

DIGITAL High Performance Technical Computing (HPTC) InfoCenter
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